

WATERSHED HEALTH, RIPARIAN, AND SOILS (WS); **SOILS**

(1) Overview

A. Project Level Monitoring

Observations of effects on the ground will be predominantly ruts, compaction, presence of organic layer or disturbance/removal of the organic layer, rills, and gullies on treated acres (“post treatment monitoring”). Some units will be visited prior to treatment activity as “pretreatment” monitoring. Information that was used in the Forest Plan DEIS was broad scale and was from multiple sources and locations. (Table 1)

Table 1. Information sources & calculation used for determining potential primary skid trail compaction*		
Superior	Source	Comments
	TSPIRS 1998 Report, Chippewa National Forest	Low level aerial photo interpretation, Dave Shadis
5%	Closeout CEQ, 2000, Superior National Forest	Field measurement of storm sites, primary skid trails, Tom Bailey, Jason Fischbach 1999
12%	Soil Disturbance and aspen regeneration on clay soils: Three case histories, Sept/Oct 2000, The Forestry Chronicle, Vol 76, No. 5	Doug Stone and John Elioff, field sampling We used two of their case histories; the third was not representative so was not included.
11%	Same as above	Same as above
8%	Forest Soils, GEIS, 1992	Page 67
2.2%	Kawishiwi Ranger District monitoring; 1997	Field sampling, monitoring; Robert Kari, 1997
13%*	Crescent Lake EA, Gunflint, Griddle, Little East (most in Crescent)	Field Monitoring and personal observation, Jeff Tepp, 2002
9%	Average of 6	

We determined that this level of monitoring was too broad of a scale to be helpful during project level treatments and associated “implementation monitoring”. During FY03 and FY04, effectiveness monitoring was accomplished on skid trails and landings on the SNF to obtain site specific information on routine activities, rather than rely on regional or national information (Table 2, 3). A trend that we can see in Table 2 is that there is a difference between blowdown treatments and more routine activities on the Forest. It appears that there was an overall higher average of compaction occurring in Blowdown units than in regularly treated units such as the Kawishiwi units displayed in Table 2. This is due to the configuration on bedrock of some of the units, poor weather conditions, and the increased workload and urgency of response to the Blowdown.

We initiated compaction monitoring in 2005 by testing the usefulness of a soil penetrometer in the Kadunce River EA. SNF has many acres of dense bouldery till or shallow material underlain by bedrock which makes the use of a soil penetrometer more difficult to implement as well as giving less reliable results. Monitoring on the Kadunce harvest unit was a “pre-harvest monitoring” which included transects to determine organic layer depth, soil disturbance, and soil compaction.

Table 2. Monitoring sites mostly on Blowdown 1999 projects

Landing, Skid, Temp Rd Summary November 20, 2003								
Resource	Unit	Landing	% of	Skid	% of unit	Temp Rd	% of unit	%Landing, skid, temp rd
Blowdown units:	Acres	Acres	Unit	Acres		Acres		for treatment polygon
Closeout on CEQ,2000								
Bow Sale, Polygon 66	5	0.30	6.00	0.41	8.00	0.07	1.00	15.6
Shokobow Sale, Polygon23	11	0.43	4.00	1.10	10.00	0.32	3.00	16.8
Ham Sale, Polygons 107/109	44	0.64	2.00	2.10	5.00	0.64	2.00	7.7
Larch Sale, Polygon 77	31	0.16	0.50	1.60	5.00	0.00	0.00	5.7
Hungry Bear Sale, Polygon 32.1 & 32.2	57	5.00	9.00	2.60	5.00	0.31	5.00	13.8
Rudy Sale, Polygon 36	49	4.00	8.00	0.90	2.00	1.50	3.00	13.1
Dumpster Sale, Polygon 66	60	0.68	1.00	4.10	7.00	0.00	0.00	8.0
Kawishiwi units:								
South Moose Sale, 1997, Unit 5	24	0.14	0.60	0.33	1.40	0.70	na	4.9
Boundary Sale, Unit 9	11	0.18	1.60	0.33	3.00	0.19	1.70	6.2
Boundary Sale, Unit 4, winter	22	0.41	1.90	0.00	0.00	0.64	2.90	4.8
Total	314	11.94	3.80%	13.47	4.30%	4.37	1.40%	
Overall % for Landing + Skid Trail + Temporary Road= 9.5%								

District	Trail Overall	Trail Winter	Trail Summer	Landing Overall	Landing Winter	Landing Summer
LAU	1.33%	2.07%	0.81%	0.74%	0.74%	NA
TOF	1.27%	1.27%	1.27%	0.21%	0.21%	0.21%
KAW	1.34%	1.33%	1.35%	0.39%	0.49%	0.20%
GUN	2.14%	2.14%	NA	0.54%	0.47%	0.83%
LAC	1.95%	1.55%	2.29%	1.58%	2.36%	1.06%
Tot Dist Avg	1.61%	1.67%	1.43%	0.69%	0.85%	0.57%

Overall % average: 1.13%
 "Trail" means primary skid trail

Soil scientists also monitor the presence and depth of organic layer (duff) in regard to fuel_reduction activity associated with BWCAW EIS, 2000. This is one measure of productivity outlined in R9 Soil Quality Standards (FSH 2509.18, Chapter 2) and in our current Forest Plan (guideline GW-10, 11). From FY 2001 through 2004, pretreatment and post-treatment monitoring occurred. During 2005, monitoring for fire included the Sawbill Creek patch burn (Crescent Lake EA). Preliminary fire monitoring suggests overall good retention of organic matter, although ELTs with shallow material and in high elevation landscape positions burned more severely than deeper materials in mid and side slope landscape positions. Monitoring transects for burning was also accomplished on the Alpine wildfire. Limited monitoring was done as weather conditions deteriorated. However, it was observed from limited monitoring (4-5 transects) that drier conditions and more severe burning occurred on ELTS 17 and 18 than was observed on prescribed burns areas/

In FY 2005, 14,447 acres of fuel reduction burn treatments were accomplished. These are eligible sites to monitor during the field season in FY2006. Field monitoring forms and methodology has been developed and will be utilized during monitoring.

B. Landscape Level Monitoring

Monitoring management treatments Forest-wide throughout the decade will provide a more comprehensive view of soil disturbing activities. This will provide data in terms of treatment acres and spatial distribution in LTAs across the Forest. One advantage of landscape scale monitoring is to get a clearer look at how the nutrient sensitive sites have been treated. One way to measure success in these areas is to increase conifer plant communities on ELTs 7,8,9,11,16, 17, and see more use of partial harvests. This will help understand the relationship of landscape scale monitoring to the site monitoring as it relates to implementing the guidelines (G-WS- 8 through 11).

Another way of noting success Forest-wide is through the Watershed Improvement projects that are undertaken annually to rehab naturally occurring erosion and to rehab user-developed trails and pathways that allow sedimentation into streams and lakes.



Little East Creek access trail 2002—before



Little East Creek Access trail –after (Sept 2005)
Fill brought in, smoothed site, grassing in.

Watershed improvement projects have been a strong component of the soil/ecs program which, for several decades, annually upgrades sites that have eroded, some due to lake level changes, some due to natural erosion. Watershed improvement projects have filled abandoned wells, reworked trails to be placed on more appropriate ELTs, and restored plant communities appropriate for riparian areas.

(2) Monitoring Activities

Monitoring Question

Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the the land?

Monitoring Driver(s): Desired Condition. FWD. D-WS-12; and 36 CFR 219.12k2. Soils recover from natural disturbance events and absorb the effects of human disturbances without reducing productivity and function. Soils contribute to ecosystem sustainability. Soil-hydrologic function & productivity is protected, preserving the ability to serve as a filter for good

water quality & regulation of nutrient cycling. Soil exposure is minimized. There is minimal compaction, displacement, & puddling. Severely burned conditions resulting from mgt-ignited fire occur infrequently.

Applicable Monitoring Activity, Practice, Or Effect Measured	Methods	When Monitored	Location or Project Area
Physical soil changes such as: deep ruts, puddles, depressions, compaction, loss of organic layer, soil strength, soil movement, rills, gullies, lack of sufficient ground cover, where appropriate, to prevent erosion, mass movement.	SITE LEVEL: Prioritize sites by compaction class, nutrient sensitivity, etc. Visit sites, record measurements and observations along transects.	June through September	Forest wide.

Monitoring Driver(s): Desired Condition D-WS-3. Watersheds and soils are maintained or restored in a way that allow for the conservation of the genetic integrity of native species. Physical properties of soil are maintained and enhanced. Watershed and habitat restoration projects are natural appearing and favor the use of native materials or naturalized species to the extent practical.

Applicable Monitoring Activity, Practice, Or Effect Measured	Methods	When Monitored	Location or Project Area
Lands adequately restored after treatment activity. Slopes show no erosion, use of water bars and erosion control methods working properly where used.	Periodically visit watershed improvement projects. Record status and needed maintenance, if any. Identify areas of Forest where improvement activities are needed.	June-September	Forest wide

Monitoring Driver(s): O-WS-9. Protect, and where appropriate, restore the soil resource. Improve and protect watershed conditions to provide the soil productivity necessary to support ecological functions. Protect and restore areas where soils are adversely impaired and contributing to an overall decline in watershed condition, soil productivity, soil quality, and soil function. Do this by using management practices, inventory and monitoring results, and findings from the inventory of ecological units. During all management actions involving soil disturbance, minimize soil displacement, nutrient loss, and effects of severe burning.

Applicable Monitoring Activity, Practice, Or Effect Measured	Methods	When Monitored	Location or Project Area
Acres of nutrient sensitive ELTs treated. Analyze acres maintained in conifer, regenerated for conifer, types of burn.	LANDSCAPE LEVEL: Record acres of treatment activities forest wide (harvest, partial cuts, prescribed burns) on nutrient sensitive sites. Use FACTS, amls for spatial analyses by LTA, ELT.	November	Forest wide on EA/EIS possibly 1-3 years after decision notice.

Monitoring Driver(s): O-WS-10 During all management actions involving soil disturbance: Maintain adequate ground cover and soil organic layers, both during and after treatment, to minimize erosion (including rill and gully formation) and allow water to infiltrate the soil. Minimize soil displacement, nutrient loss, and effects of severe burning. Restore and re-vegetate disturbed areas. Provide for the maintenance of physical, chemical and biological properties of the forest floor (soil organic matter, Surface O layer), that makes soil productive. Protect soil-hydrologic functions by minimizing rutting, puddling, and compaction.

Applicable Monitoring Activity, Practice, Or Effect Measured	Methods	When Monitored	Location or Project Area
Determine if nutrient sensitive sites have reforestation techniques to provide for nutrient retention. Determine amount of organic layer (duff, forest floor) retained, slash retained on site. and burn effects on soil.	SITE LEVEL: field reviews by soil scientists. Determine through Databases and GIS spatial analysis location/acres of acres treated. Prioritize by ELTs to examine most sensitive sites to burning and nutrient loss. Review burn data to determine if ignition timing and firing patterns, BUI, appropriate for ELT. . Provide for pretreatment and post-treatment field review. Measurements and observations along transects.	June - September	Forest wide on EA/EIS possibly 1-3 years after decision notice.

(3) Evaluation and Conclusions.

Desired Conditions/Objectives

Monitoring Driver(s): Desired Condition. FWD. D-WS-12; and 36 CFR 219.12k2. Soils recover from natural disturbance events and absorb the effects of human disturbances without reducing productivity and function. Soils contribute to ecosystem sustainability. Soil-hydrologic function & productivity is protected, preserving the ability to serve as a filter for good water quality & regulation of nutrient cycling. Soil exposure is minimized. There is minimal compaction, displacement, & puddling. Severely burned conditions resulting from mgt-ignited fire occur infrequently.

2005 Accomplishment For the time period of Oct 2004 to September 2005, EAs or EIS' implementing Forest Plan 2004 were recently signed decisions. As a result, relatively few treatments were accomplished under the revised Plan or were accomplished so late in the field season that monitoring was not accomplished. Projects from the Virginia EIS that were accomplished and are eligible for monitoring include 82 acres of clear-cut with reserves, even-aged management; 45 acres of clear-cut with reserves uneven-aged management; and 11 acres of shelter-wood, even-aged regeneration harvest (From FACTS, 11/22/05). There is emphasis on nutrient sensitive sites that have lower nutrient capital that encourages long term management for the site in order to maximize nutrients available related to the "Activity Limits Code E and F" to be used with Table G-WS-8—Limits on Management Activities Designed to Safeguard Soil Productivity on Superior National Forest.

Forest Direction/Conditions, Accomplishments, and Achievement of Forest Plan Direction

A. FOREST PLAN DIRECTION/FEIS CONDITION				
Record of Decision (July 2004)	(DECADE 1)		2005 Accomplishments and/or Condition	
Existing Condition	FP DC, Objective, or S&G's	FEIS Projected or Proposed Condition	Actual Accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions
No long term soil productivity sites are on the SNF. There are no permanent plots for soil monitoring on the Forest. Improvement projects have occurred during treatment projects over time or operators applied mitigation techniques during project implementation.	FSH 2509.18 Chapter 2; G-WS-8, 9,10, 11;	Treatment units have minimal compaction, rutting, soil displacement, etc	Kadunce Hunter Walking Trail EA pretreatment compaction monitoring.	~

B. ACHIEVEMENT OF FOREST PLAN DIRECTION/FEIS CONDITION			
% Achievement of Decade 1 Direction/Condition		Trend	
Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions	Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions
NA	NA	NA	NA

Monitoring Driver(s): Desired Condition D-WS-3. Watersheds and soils are maintained or restored in a way that allow for the conservation of the genetic integrity of native species. Physical properties of soil are maintained and enhanced. Watershed and habitat restoration projects are natural appearing and favor the use of native materials or naturalized species to the extent practical.

A. FOREST PLAN DIRECTION/FEIS CONDITION				
Record of Decision (7/04)	(DECADE 1)		2005 Accomplishments and/or Condition	
Existing Condition	FP Desired Condition, Objective, or S&G's	FEIS Projected or Proposed Condition	Actual Accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions
Forest has minimal erosion and unstable shorelines	Watershed restoration projects stabilize slopes and shorelines, enhance riparian areas.	Acres of annual improvement projects will stabilize slopes and reduce or prevent sedimentation into lakes and streams.	10 acres (Examples include: Sturgeon River erosion control; Beaver Lake access; Little East Creek rd, Beaver R. riparian planting, and more.	Birch Lake CE Little East Creek EA Virginia EIS

B. ACHIEVEMENT OF FOREST PLAN DIRECTION/FEIS CONDITION			
% Achievement of Decade 1 Direction/Condition		Trend	
Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions	Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions
Restored or improved watershed and Soil resources.	10 acres	10 acres. Trend is to treat more acres annually. FY06 will accomplish 50 acres. Attending to projects that have waited for attention 10-20 yrs or longer.	Attention to problem areas are Responded to more rapidly. Projects are more complex than erosion control, and are Now more watershed-based.

Monitoring Driver(s): O-WS-9. Protect, and where appropriate, restore the soil resource. Improve and protect watershed conditions to provide the soil productivity necessary to support ecological functions. Protect and restore areas where soils are adversely impaired and contributing to an overall decline in watershed condition, soil productivity, soil quality, and soil function. Do this by using management practices, inventory and monitoring results, and findings from the inventory of ecological units. During all management actions involving soil disturbance, minimize soil displacement, nutrient loss, and effects of severe burning.

2005 Accomplishment .SEE ABOVE.

Forest Direction/Conditions, Accomplishments, and Achievement of Forest Plan Direction

A. FOREST PLAN DIRECTION/FEIS CONDITION				
Record of Decision (7/04)	(DECADE 1)		2005 Accomplishments and/or Condition	
Existing Condition	FP Desired Condition, Objective, or S&G's	FEIS Projected or Proposed Condition	Actual Accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions
1. Acres treated by harvest type—need aml, by ELT 2. Prescribed fire acres treated by ELT	LANDSCAPE LEVEL: Nutrient sensitive sites Treated. Nutrient sensitive sites Treated.	4328 ac/yr 7900 ac/yr	Developing baseline for Landscape level analysis	NA

B. ACHIEVEMENT OF FOREST PLAN DIRECTION/FEIS CONDITION			
% Achievement of Decade 1 Direction/Condition		Trend	
Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions	Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions
NA	NA	NA	NA

Monitoring Driver(s): O-WS-10 During all management actions involving soil disturbance: Maintain adequate ground cover and soil organic layers, both during and after treatment, to minimize erosion (including rill and gully formation) and allow water to infiltrate the soil. Minimize soil displacement, nutrient loss, and effects of severe burning. Restore and re-vegetate disturbed areas. Provide for the maintenance of physical, chemical and biological properties of the forest floor (soil organic matter Surface O layer), that makes soil productive. Protect soil-hydrologic functions by minimizing rutting, puddling, and compaction.

2005 Accomplishment .SEE ABOVE.

Forest Direction/Conditions, Accomplishments, and Achievement of Forest Plan Direction

A. FOREST PLAN DIRECTION/FEIS CONDITION				
Record of Decision (7/04)	(DECADE 1)		2005 Accomplishments and/or Condition	
Existing Condition	FP Dc, Objective, or S&G's	FEIS Projected or Proposed Condition	Actual Accomplishments implemented	Actual Accomplishments & Approved NEPA
Monitoring of BWCAW EIS—prescribed burns 2000-2005	G-WS-8 G-WS-9 G-WS-10 G-WS-11	Sensitive nutrient ELT treatment units have minimal loss of organic layer & minimal severe Burning. Treatment units also provide for Long term forest to maintain nutrients on site.	Sawbill Creek patch burn; Alpine wildland fire. BWEIS Prescribed burns.	

B. ACHIEVEMENT OF FOREST PLAN DIRECTION/FEIS CONDITION			
% Achievement of Decade 1 Direction/Condition		Trend	
Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions	Actual accomplishments implemented	Actual Accomplishments & Approved NEPA Decisions
Monitoring results indicate that organic layers following prescribed burning generally in tact.		Overall there is good retention of organic Layer. ELTs on shallow sites burned more severely on high elevation sites than in deeper material in mid to low side slopes.	

Standards and Guides

S&G Descriptor	Standard & Guide Description	Compliance
G-WS-8	Follow the limitations on management activities as specified in Table G WS-8.	NA
G-WS-9	During resource management activities, minimize adverse impacts to soil productivity by striving to have no more than 15 percent of a treatment area in a detrimentally compacted, eroded, rutted, displaced, or severely burned condition	NA
G-WS-10	When conducting prescribed burns on ELTs 7, 8, 9, 11, 12, 16, 17, & 18, minimize the loss of surface O layer. Provide for: a. Igniting burns only when the Canadian Fire Weather Index System Build Up Index (BUI) is 50 or less. b. Adjustment of ignition timing and firing patterns c. Taking into account vegetation type, topography, number of days since precipitation, wind, air temperature, humidity, and fuel loadings.	NA
G-WS-11	On ELTs 7-9, 11, 12, & 16-18, mgt activities ...will be designed & conducted to minimize loss of surface O layer & duff layer.	NA

(4) Necessary Follow-up and Management Recommendations

Monitoring Driver	Follow-up Actions
D-WS-12; & 36 CFR 219.12k2	FIDT project regarding nutrient sensitive ELT 18: complete guidance by end of July 07. Relates to Land Suitability Class.
D-WS-12;& 36 CFR 219.12k2	BWCAW EIS—originally planned on 10%, implementation monitoring, moves into effectiveness monitoring..
O-WS-9	Monitoring on ELT 18 related to Trail EIS needs. Monitoring designed specifically for ELT 18, ability to regenerate, and productivity issue.
O-WS-10	Emphasize that monitoring needs to include all activities that has soil disturbance whether it is for plant communities, recreation, engineering, or etc.
All	Note: There needs to be more “integration” in our monitoring report-- ELTs/LTAs could be tied more to veg component (specifically, land suitability class).
O-WS-9	Develop or revise AML’s used in FEIS that will address the landscape level/forest wide monitoring (ties to analysis done for Plan).
Soils Table G-WS-8	FIDT to discuss how to best integrate & interpret soil S&G’s when implementing vegetation and fire treatments. <u>Supporting rationale</u> . This standard precludes fuel treatments that may affect the red and white pine over story within stands below 60% canopy closure. Ramifications of this standard include: (1) It is contrary to historic disturbance patterns that were necessary to establish & maintain pine ecosystems. (2) May limit implementation of hazardous fuels reduction projects in areas of heavy under story fuel accumulation. (3) May limit pine regeneration. (4) May limit under story vegetative diversity.

(5) Collaborative Opportunities To Improve Efficiency And Quality Of Program

Collaborator/Partner	Monitoring Activity	Accomplishment
None at this time.		